

## TCU timing measurements

Short answer: Clock supplied to TCD from New TCU is ~7.6ns faster than the Old TCU

Long answer:

The trigger system transit time was measured with an oscilloscope. The difference between a simulated PMT pulse signal (via AWG) into the BB001 QT input 1 and output #3 of the ETOW TCD (ETOW trigger) was measured at 1.55us for both new and old TCUs. Measurement was good to ~10ns.

The clock phases for the two TCUs were measured with an oscilloscope triggered on a clock from the RCC (via the Rat board). The TCD clock signal was measured at the frond of the ETOW TCD:

ETOW TCD w/ new TCU (TCUI rcf cable selected)	= 53.2ns +/-2ns
ETOW TCD w/ old TCU	= <u>60.8ns +/-2ns</u>
Difference	= - 7.6ns

The difference between the trigger data bits (e.g. token, trigger cmd, daq cmd) and the rhic strobe provided by the TCU as measured at the backplane of the TCD was 75.2ns . This is with a jitter of 6ns full width, and the default TCU delay settings (dataDelay=0). The receipt of trigger command by the TOF TCD was found to be stable for dataDelay settings of 0 through 5. Setting dataDelay = 7 was also stable but the trigger command was clocked in 1 strobe late. The time difference between the rising edge of the trigger data bits and the falling edge of the rhic strobe (where the data is clocked into a TCD) was

dataDelay = 0	75.2ns +/-4ns (default)
dataDelay = 1	63.2ns
dataDelay = 5	2ns